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MODIFICATION OF CLASSIFICATORY COMPETENCE AND LEVEL OF REPRESENTATION AMONG LOWER-CLASS NEGRO KINDERGARTEN CHILDREN.

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The basic hypotheses were (1) children with detailed exposure to objects would increase in knowledge of the complexity of objects but would also exhibit a corresponding increase in object-picture discrepancy, (2) children exposed only to pictures would show minimal object-picture discrepancy but would exhibit a lower response repertoire, and (3) children using objects followed by pictures would show most increase in classification skills, exhibiting less object-picture discrepancy. The sample consisted of 117 children of lower socioeconomic class from kindergartens of representative inner-city, lower class schools. Tests administered were the Object-Picture Categorization Test, a Haptic Test, and the Motor Encoding Test. Results indicate that classification training does enhance the child's ability to employ grouping and scorable responses, as well as increase the variety of criteria by which to classify. Detailed results, tables, and appendixes are included. This paper was presented at the Sixth Work Conference on Curriculum and Teaching in Depressed Areas, Teachers College, Columbia University, June 1967. (EF)

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Modification of Classificatory Competence and Level of Representation among Lower-Class Negro Kindergarten Children[*]

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Introduction

In two previous studies, lower-class Negro children were found to have difficulty organizing familiar three-dimensional objects into rational groupings. These children had even greater difficulty categorizing pictorial representations of these objects (Sigel, Anderson, Shapiro, 1966; Sigel, McBane, 1967). When the children do classify, they tend to group items predominantly on the basis of color. Use of such other object characteristics as form or function was relatively infrequent. The conclusion drawn from these studies was that lower-class children were deficient in classification skills, were limited in the kinds of criteria employed, and were not able to deal with representations of objects (pictures in this case) consistently with their organization of three-dimensional life-sized objects.

Such deficits are educationally dysfunctional. A host of subsequent educational experiences, ranging from mastery of subject matter areas (number, science, reading) to problem solving skills are dependent upon mastery of classificatory and representational competence. Early intervention becomes

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a necessity in the educational experience of such disadvantaged children, thereby enabling them to enter the educational mainstream with the requirements necessary for subsequent functioning.

A review of the educational research literature reveals a relative paucity of systematic procedures aimed at intervention in the educational life of those lower-class children explicitly to facilitate classificatory and representational competence. When used, classification exercises frequently contain geometric forms which are essentially non-sense items having little relevance to everyday experience. The claim that such materials are simpler than realistic items ignores the fact that real life objects have a palpable reality, whereas geometric forms are abstractions having little realistic reference.

There is need to define the course of classificatory competence with realistic objects which form a large segment of the experiential world of the child. How he organizes objects, the criteria he employs to build such organization of objects, and the flexibility with which such organizations are built and rebuilt are issues which have been the central interest of some more recent studies (Annett, 1959; Bruner, Olver, Greenfield, 1966; Inhelder, Piaget, 1964; Sigel, 1964). These studies, however, have been limited to middle-class children. The degree to which the course of such cognitive growth is class related needs further study. Further, with few exceptions, extensive follow-up of this phenomenon has yet to be done.

Objectives of This Study

The report to be made in this paper focuses on aspects of classificatory behavior among lower-class children. Specifically, this paper will deal with the following questions:

(1) What modes of classification are employed by lower-class Negro children when faced with arrays of three-dimensional familiar objects and with representational instances of these objects?

(2) What training procedures and what class of materials will be most effective in inducing change in classificatory and representational behaviors?

(3) If increased competence is in fact achieved, are these newly acquired skills transferred to other tasks, particularly representational kinds of behavior?

Rationale for the Study

A pilot study demonstrated that preschool children's cognitive competence vis-a-vis classification skills can be enhanced through appropriate intervention techniques. It was found that preschool children, working in small groups (of about 6) with teachers who structured the situation so as to elicit labeling, grouping, and regrouping behavior, increased their performance in similar type tasks.

In this pilot study, the basic decision revolved around the training procedure. Analysis of classification behavior to identify processes involved in classification was done to determine which of these could be translated into sequential steps to form the basis of the teaching strategy. Such analysis led to the conclusion that categorization essentially requires a knowledge of object characteristics--observed or inferred--and the ability to perceive similarities, even in the face of apparent difference. If this awareness is not present, rudiments for building groups do not exist. To be sure, the prerequisite for these decisions is the ability to perceive the identity of objects independent of the perceiver and thereby recognize that objects have their own integrity. As a consequence, it becomes possible to group objects on the basis of objectively defined criteria and not in terms of idiosyncratic qualities. In effect, classification requires a break from an egocentric posture and a move toward objectification. Object identity is a basic requirement which, if mastered, sets the stage for analysis of object components with appropriate labeling, and finally, extracting particulars as bases for extended grouping.

Such categorization behavior is reflective of an objectification of the physical world. The criteria selected as bases for classifying can vary from objective to inferred, e.g. color, form, or class membership. Each of these is a valid and acceptable choice. But the criteria children or adults choose is indicative of a preferred mode or style. Classification behavior not only is indicative of the abilities described above, but also of the preference for particular types of attributes. This is an important distinction too often overlooked--when a child, for example, organizes objects on the basis of color or form, it does not necessarily mean he cannot use other criteria. He may just prefer "form" or "color" and deliberately or not ignore alternatives. Hence, in classification tasks, especially those allowing for open-ended grouping, it is necessary to distinguish between preference and ability (Kagan, Moss, Sigel, 1963; Kagan, Rosman, Day, Albert, Phillips, 1964; Sigel, Jarman, Hanesian, 1967).

On the basis of these considerations a training procedure was developed in which children had first to establish the identity of the object, and its manifold characteristics, e.g. a shoe was identified and defined in terms of its multiple attributes. Given such an acquaintance, new objects were introduced, defined, etc. Armed with this knowledge, the child was prepared to identify differences and similarities among objects. This type of information forms the basis for building groups.

A final consideration was how to intervene--what, in effect, is the best teaching strategy? On the basis of previous studies with different kinds of children, it was decided to use a "structured discovery" approach where the children were free to employ their verbal skills in labeling and grouping objects.

Since one of the goals of this study was to reduce dissonance between classification of the object and its representation (picture), each type of material was employed in the training--specifically, three-dimensional familiar objects and life-sized color photographs of those objects.

Hypotheses

It was hypothesized that the type of material in the training would have differential effects on consequent grouping behavior as well as the object-picture discrepancy. Children provided with detailed exposure to the objects (OT) would increase in knowledge of the complexity of objects and would therefore have greater awareness of object characteristics. This should lead to a large repertoire of responses from which to draw in subsequent classifications. Thus, in categorizing tasks after training they would be expected to produce a larger response pool than in the pretraining testing. However, the object-picture discrepancy would be expected to increase since learning to work with representational material is not provided.

Children exposed only to pictures would be expected to increase in the kind and quality of responses. Working with two-dimensional items, these children will have relatively fewer cues available to them than children working with three-dimensional items. Consequently, children involved in the picture training condition (PT) should show minimal discrepancy between objects and pictures, having presumably learned about classification with pictures, but a lower response repertoire than children in each of the other two training groups.

The third condition, use of objects followed by pictures (OPT), should be the most effective condition since it incorporates each of the two previous procedures--allowing for opportunity to become acquainted with the object and its representation.

In sum, then, the basic hypothesis of this study is that given classification training, the most effective condition for increasing classification skills, while at the same time reducing object-picture discrepancy, will be the object-picture training condition (OPT); the next most effective in reducing the object-picture discrepancy would be the picture condition (PT), with relatively few improvement in classification skills; and the object alone condition (OT) would be expected to yield maximum gain in classification skill and least effect in reducing object-picture discrepancy.

If representational thought, however, is viewed as essentially the capacity to create mental images (verbal or pictorial) and to deal with events and objects without physical presence, role playing should facilitate the acquisition of representational thought. The exposure of children to role-playing activities and the opportunity to act out ideas may be the prelude to representational thinking. Roles as objects define aspects or functions of a person. Therefore, the awareness of the multidimensionality of individuals as of objects might be viewed as facilitating representational thought. Consequently, another training procedure will be a role-playing experience.

It might be contended that classification skills involve verbal facility. Therefore experience in language usage, with particular emphasis on talking about various matters, may be considered a particular experience that could facilitate classification skills and representational behaviors. If children are provided an opportunity to employ language in the service of communication about specific objects and events, these experiences will influence their capability in dealing with classification skills. Verbal experience might be expected to facilitate classification skills, especially the production of articulate responses. It should have more impact on classification than on reducing the object-picture discrepancy.

Now let us turn to a set of hypotheses comparing the relative significance of each of these training procedures. Three types of training procedures can be defined; one comprises the classificatory training situations which vary only in terms of the nature of the materials employed, second, role playing, and third, verbal interaction. These latter two share the commonality of not involving any explicit classification training. The expectation is that classificatory training, irrespective of modality of material involved would have more impact on classificatory behavior as well as on reduction of the object-picture discrepancy than role playing or verbal interaction. Since classification training is more directly relevant to performance on categorization tests, the training will provide the basis for generalization. The other training techniques, being more indirect, will provide some improvement, but not maximal gain.

It will be recalled that a final question posed in the previous section ✓ was the relationship between the types of training employed in this study and other tasks reflecting representational thought. The contention is that training in the verbal interaction condition and the role playing would contribute more to representational behavior than classification training. Hence it would be expected that the children receiving non-classification training experience would do better on these tasks than the children trained in classification. Of the classification trained, those children working with pictures would be more effective than those working with objects.

Methods and Procedures

Test Materials and Procedures

Each child was given a battery of tasks which included the Object-Picture Categorization Test, a Haptic Test, and the Motor Encoding Test (a subtest of the Illinois Test of Psycholinguistic Abilities).*

The Object-Picture Categorization Test is a sorting task made up of two parts, an Object Test (OCT) and a Picture Test (PCT). Twelve familiar three-dimensional, life-sized items are involved, e.g. ball, cup, spoon, etc. (See Figure 1.) In the OCT these items formthe test, while in the PCT life-sized colored pictures of these items are used.

Insert Figure 1 about here

For the OCT and the PCT identical test procedures are used. Each test involves an Active and a Passive Condition. The Active Condition task requires the child to select from an array of objects all those items he judges as similar to the stimulus object selected by the experimenter and provide a reason for his grouping. The Passive Condition requires the child to label arrays of objects made by the experimenter.[1] (See Appendix A for details of test procedures.)

The responses are scored so as to obtain three types of information; ability to group, quality of verbalization, and the basis employed in grouping.

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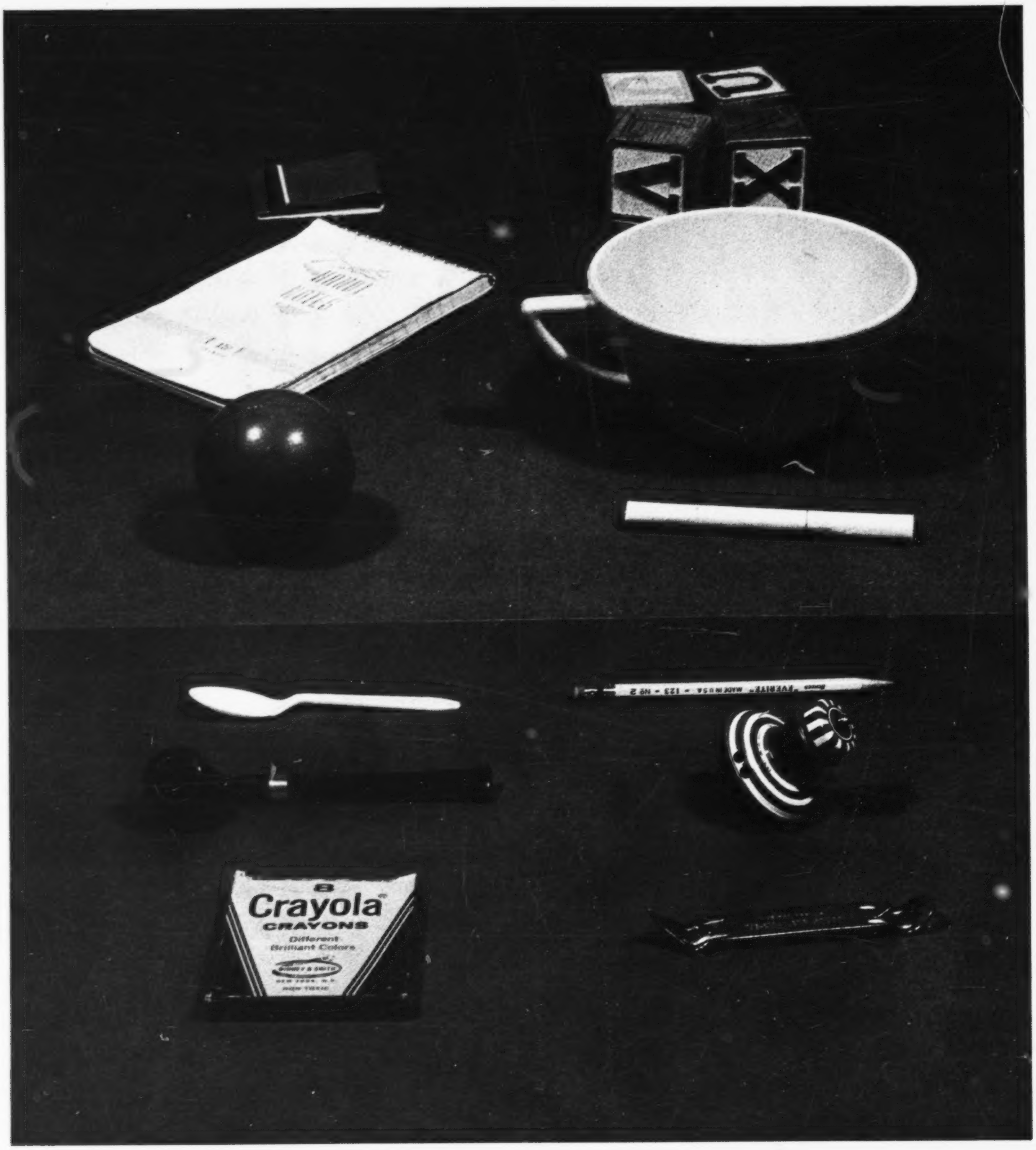
* The battery also included geometric preference and sorting tasks, but these are not discussed here since the results are not reported in this paper.

Fig. 1



CATEGORIZATION TEST OBJECTS

In this report, the focus will be on grouping responses, those responses giving meaningful relationships between all the items selected, and scorable responses, those in which all the items selected are not included in the answer or the relationship given is incorrect. A third emphasis will be upon the bases of grouping, i.e. the content of verbalization involving three categories as follows: descriptive, relational-contextual, and categorical-inferential.

Descriptive responses refer to those types of statements denoting physical palpable cues which are used as the basis for classification. Three types of descriptive responses exist: color, the employment of any color label; form, which refers to shape, e.g. round, straight, curved, etc.; and structure, which refers to any aspect generic or inherent in the stimulus object, e.g. legs, eyes, holding something, handles, stems, etc. This latter is in effect a generic part-whole content category, whereas color and form are attributes that may or may not be generic to the object. The color of a cup, for example, may vary, but its variability does not necessarily alter the identity of the cup; or it may vary in form, e.g. rectangular or elliptical, but it is still a cup.

Relational-contextual responses are of two types; thematic, where objects are related in terms of a story or theme or use, where objects are related in terms of their interdependent function. It is a type of chaining response, where objects are related in that specific context (e.g. a spoon and a cup are related because the spoon is used with the cup; matches and cigarette are related because the matches are used to light the cigarette.

Categorical-inferential responses refer to those which are traditionally referred to as class labels or concepts. The label refers to an array of items, which although appearing different are members of the same class. A formal definition is that for every instance of the array the class label can apply and the criterial attribute has to be inferred and is not observable. A number of sub-types of categorical-inferential exist, e.g. functional, "things you eat with," class labels, e.g. animal, furniture; single inferred attribute, e.g. living things, moving things, etc. (See Appendix A for details of scoring.)

The Haptic Test is made up of ten geometric and ten realistic objects. The aim of this task is to assess the ability of the child to identify form through tactile cues only. Seated behind a screen, the child is handed a stimulus object which he is asked to identify. Identification is assessed by having the child select the form from an array of forms. Thus the child has to translate tactile cues into perceptual recognitary ones. The accuracy in the identification task, the time taken to make the identification, as well as the kinds of searching movements used are recorded.

The Motor Encoding Task, a subtest of the Illinois Test of Psycholinguistic Abilities, requires the child to define objects in pantomime. A series of pictures are used after initially introducing the task with three-dimensional items. The score is the number of correct gestural definitions (McCarthy, Kirk, 1961).

Each child was seen twice. One of the categorization tasks was given along with the Haptic and/or Motor Encoding. About 45 - 60 minute periods were used for each child for each session.

The categorization task was the only one with possible practice effects. Thus, one half the sample received objects, followed a week later by pictures; the other half received the reverse. In posttest, the procedures were reversed, those receiving the object-picture sequence received the picture-object sequence, and similarly reversed for the picture-object sequence.

Training Procedures

The design of the training aspect of the study is as follows: six groups of children were established, five of which were to receive the particular types of treatment briefly alluded to in the Rationale of the Study section and the sixth being a no-treatment group. The five training groups reflect each of the hypotheses in terms of effectiveness of various types of materials and are as follows: (1) the OT group of children, trained with objects alone; (2) the PT group, trained with pictures alone; (3) the OPT group, trained with objects and pictures; (4) the VI group, which contained verbal experiences, (5) the RP, role-playing, group, with children spending time in acting out real or imagined roles of inanimate objects (stop signs, posts, trees, etc.) and animate objects (human and animal); (6) the NT group, which received no additional experience.

Since the teachers were to be the trainers, it was impossible to assign children to experimental conditions. Instead schools were assigned at random to each of the five training situations. Children in NT grouping were selected from each of the schools. Each training condition was held in a separate school. Two groups of children in each school were involved, one in the morning and one in the afternoon.

Assignment and Training of Teachers. The teachers who were involved in the OT, PT, OPT, and RP groups were brought together for three training sessions. The teacher involved in the verbal interaction was not invited to participate, since the type of training involved in classification had to be kept from the VI teacher so as to be certain that verbal training did not inadvertantly include classification type activities. She was told that fluency was to be the point of her training and that the effect of fluency training on intellectual growth was the object of the study. The role-play situation was clearly prescribed and consequently this teacher could not be influenced in her actual training behavior. This actually was born out. The no-training group (NT) was made up of children who could have qualified for any of the training groups, and who were in the same classrooms with the five training teachers. These children never received any small-group interaction. There is no doubt that just being removed from the classroom might have its effect. However, the relative significance of this could be tested by comparing the VI and RP groups with the NT group. In sum, there were five training groups, ✓ three of which used classification training and two of which used different kinds of training.

The purposes of classification training were described to the teachers, who were encouraged to participate in developing the curriculum guide. The guide was then developed to provide exposure and experience in classification behavior. The guidance of the speech teacher was included because this type of training is not unlike the procedures used in speech therapy.[2] The initial training with the teachers was identical to that which they were to use with the children. The authors played the role of the teachers and the teachers were asked to play the role of the children. The teachers were encouraged to label objects, discuss them in a variety of ways, group and regroup them, and play a number of games, each of which was intended to facilitate the use of labeling behavior and perception of similarities and differences between objects and within objects. Only familiar, identifiable objects were used.

After these role-playing sessions, the teachers were asked to try a few practice sessions with the children similar to their training. The teachers were also asked to tape record the pilot sessions with the children. These were played back in the subsequent training session and discussed to insure comparability in procedure among all the teachers. Upon completion of these sessions with the teachers, the experiment was underway.

For the children, a total of 20 sessions, of approximately 15-20 minutes, for five days a week, were used. The teacher would take the children into a separate room where they worked just with these children, employing objects or pictures of the following classes of items: musical instruments, wearing apparel, containers, washing things, etc. (See Appendix C.)

In the verbal-interaction condition, the teacher was instructed to take out the relevant group of children and just read them a story, talk to them, and provide them with verbalization experience. The teacher was kept uninformed of the purposes of the experiment except to know that we were attempting to make some kind of assessment of this type of experience.

For the role-playing condition, the teacher was instructed to create stories and fantasy-type activities with familiar and even unfamiliar type settings and have the children play these out, for example, playing policeman, playing automobile, playing driving an automobile, riding in traffic, etc.

Each of the authors would, when necessary, visit the teachers, monitor the situations to answer any questions that came up. Weekly curriculum guides were presented to the teachers sufficiently in advance for them to study them before using them. (See Appendix C.)

After the 20 sessions and a delay of approximately a month, due to Christmas vacation, the children were reexamined with the categorizing test (including Active and Passive Conditions), the haptic and motor-encoding tasks, and now we included geometric, sorting and preference tasks.[3]

Sample

The sample of children was drawn from kindergartens of representative, inner-city, lower-class schools. One hundred and seventeen children were tested. These children were all identified as lower-socio-economic class, based on school record information of parent education and occupation.

From these 117, children who produced only 50% or less grouping responses on the Object-Picture Categorizing Test (combined score) were assigned to an experimental condition. These are referred to as Low Responders (LR). Since, however, we wished to prepare for eventual attrition, and also to provide a test for style modifiability through training, a group of high responding children (HR), who produced at least 80% of their responses in one category, were included in each of the training groups. Unfortunately the number of HR and LR could not be ideally proportioned among all the groups. Distribution of HR and LR among the training groups is presented in Table 1.

Insert Table 1 about here

Results

It will be recalled that previous research discovered that in classification tasks lower-class children had greater difficulty dealing with pictures as compared with three-dimensional objects. This phenomenon was reexamined in this project for two reasons, first as a replication, and second, to examine test order effects.

The total sample of 117 children was used to replicate the object-picture discrepancy issue. The analysis will be presented for a sample of boys and girls because strong sex differences were found previously.

Since test order was varied, with 31 boys getting the OCT and 29 receiving the PCT first, a comparison can be made of the relative difficulty of one task compared to another. The comparisons will be in terms of grouping and scorable responses only. Boys receiving the OCT first produced 37.6% grouping responses, whereas those receiving the PCT first produced 26.4%. The difference between the two is significant at the .001 level.

Similar results are found for scorable responses, where the boys receiving the OCT first produced 63.4% of scorable responses, compared to 49.7% for those receiving PCT first. This difference is significant, $p < .001$. These findings confirm the initial findings regarding the discrepancy in classificatory behavior between three-dimensional objects and their pictorial representation.

For girls, test order was varied, 32 getting the OCT and PCT, while for 25 it was the PCT and OCT. The results are very different. For those girls receiving the OCT first, 46.1% grouping responses are produced, whereas 54.3% occur among the girls receiving the PCT first. This difference is significant, $p < .02$. Contrary to the results with the boys, girls find it easier to work with the pictures. When it comes to scorable responses, no significant differences are found between the two tests (OCT = 70.8 and PCT = 74%).

Even though the tests were given a week apart, it is incumbent on us to determine if in fact there are any order effects. Again, the data will be examined for boys and girls separately.

For the boys who received the PCT first versus those who received it second, significant differences are found in the percentage of grouping responses, 26.4% and 46%, respectively. The difference is significant at the

.001 level. For scorable responses, the difference is even greater, 49.7% versus 71.2%. This difference is significant at the .001 level. The boys taking the PCT second do better. Why? Perhaps because of their experience with the OCT. The exposure to the OCT initially seems to facilitate performance on the PCT. Yet having the PCT first does not appear to influence performance on the OCT. No significant differences occur. The grouping scores are 36.6% on the OCT first and 42.2% second.

For girls, the results are again different. Girls receiving the PCT first do no better as far as grouping responses are concerned than when it was second, 53.6% and 54.3%, respectively. The results are similar for scorables, 80.7% and 74%, respectively. From these data, it can be seen that there is no significant change in PCT scores when preceded by OCT.

Does having the PCT first influence subsequent performance on the OCT? To determine this effect, let us compare the scores of the OCT when administered first or second. If the PCT does have an effect, the scores on the second OCT should be higher than the first OCT. Where the OCT is given first, the girls produce 46.1% grouping responses and 70.8% scorable, but when given second, 66% grouping and 84% scorable responses are given. The differences between first and second administration are significant at the .001 level. for both grouping and scorable responses. Thus, for the girls, in contrast to the boys, classification responses with objects are influenced by their contact with pictures. This is exactly the reverse of the results with the boys.

The order effect problem was handled by combining test orders across sexes, thereby counterbalancing obtained differences. In addition, for the purpose of overall analysis of training effects, where appropriate, OCT and PCT responses were combined.

Effects of Training on the Use of Grouping Responses in the Active Condition

An initial hypothesis of this study was that grouping and scorable responses would significantly increase with CT as compared to NCT. The means and standard deviations of the grouping scores on the pre- and posttest for each condition are presented in Table 2. Analysis of the variance (one-way) reveals that significant differences exist among the LR group in the discrepancy score--the difference between pre- and posttest scores for this category. Orthogonal analysis reveals that the source of the significance is due to the difference between the combined CT and combined NCT groups ($t = 5.0$, $p < .001$). Within group analysis reveals that no significant differences occur among each of the CT groups nor among each of the NCT groups.

Insert Table 2 about here

The hypothesis that CT is more effective in inducing grouping responses than NCT is accepted; that CT would have differential effects as a function of the medium employed in the training is rejected.

In effect, significant increase in the ability to build groups and the ability to produce articulate verbalizations results from training in labeling and in classification. Verbalization experience *per se* or role playing have no more effect than no training.

Effects of Training on the Discrepancy in Grouping Responses on OCT and PCT in the Active Condition

It will be recalled that specific hypotheses were made as to the effect of classification, verbal interaction and role-playing experience on differential responses to OCT and PCT. Chi-square analysis comparing CT to NCT, the most general situation, reveals no significant difference in the size of the discrepancy. In fact, inpection of Table 3 reveals that approximately the same percentage of children increase in the discrepancy between objects and pictures as decrease. Slightly more children do not change in the NCT group than in the CT.

Inspection of Table 3 for effects of specific experimental treatment reveals relatively little consistent effects. None of the training conditions seem to have any consistent effect in reducing the object-picture discrepancy as far as grouping responses are concerned. Each training condition, whether classificatory training or not, produces almost as much increase as decrease--the notable exception is the role-playing experience, where the majority of the children show no change. Perhaps, role playing as employed here is unrelated to the object-picture discrepancy issue. The kind of representational skills involved in the PCT may be more related to verbal type experience (CT or VI) than fantasy experience. The fact that children having no training changed at the same rate as all other groups, suggests that the changes in grouping responses may be a reflection of test reliability.*

Insert Table 3 about here

These results, in sum, lead to the rejection of the hypothesis that training experiences of the type employed here have any significant effect on the discrepancy in grouping responses between OCT and PCT. That the CT has some effect on the discrepancy between pictures and objects is noticeable, but just what the nature of that impact is is not predictable.

Since the group with no training is similar to the training groups, it may well be that training of any kind is of no more significance in influencing the size of the discrepancy between grouping responses on the OCT and PCT than no training at all.

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* Test-retest reliability coefficient for OCT is .83 and for PCT is .85.

Effect of Training on Styles of Grouping Responses in the Active Condition

In Table 4 are presented the mean scores for each style category for each of the training groups. Examination of the pretest scores on OCT and PCT indicate that *color* is the most frequent criterion employed as a basis for grouping. *Form* and *relational-contextual* responses are about equal in frequency, but considerably less than color. *Categorical-inferential* is the least frequent.

Insert Table 4 about here

After training changes are noted. In the posttest condition, *color* and *form* responses show a marked increase for the CT trained groups with the greater increase for the OCT than the PCT. Relatively little change is noted in the other style categories.

The lower one-third of the table indicates the degree of change. The higher the score here, the greater the gains. With this in mind, it can be seen that the combined CT training groups increase more in the use of *color* and *form* grouping responses for the OCT and the PCT.

Another way of examing the effect of training is in terms of the percentage of children who change in the frequency with which they employ grouping responses within the style categories. It will be noted in Table 4a that the percentage of children employing grouping responses for each of the style categories is relatively similar with OCT and PCT. After training, for the OCT, a greater percentage of children in CT condition used grouping responses

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Insert Table 4a about here

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involving color and form (color from 36% to 80%; form from 20% to 48%). Less change is noted for the other style categories.

The PCT results indicate that children with classification training increased most in the use of color, followed by increase in use of relational-contextual, then form and categorical-inferential. For the NCT conditions, less increase was noted for all categories.

In sum, CT training does seem to increase the percentage of children producing grouping responses. The major increase is with children using color for both categorizing tasks. Increases in other categories are noted too. The pattern for the OCT, however, differs from the PCT.

Effects of Training in the Use of Scorable Responses in the Active Condition

Scorable responses are those in which the child presents sufficient information for application of any one of the scoring systems but excludes from the rationale of his grouping one or more of the selected objects, or errs in the accuracy of his rationale, in contrast to grouping responses where every item has to be related accurately. Inspection of Table 5 shows that analysis of variance of change in the number of scorable responses results in

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Insert Table 5 about here

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a significant difference between the training groups. Orthogonal analysis reveals that the source of the significance is due to difference tetween combined CT and combined NCT groups ($t = 3.2$, $p < .005$). However, as in the case of the grouping responses, no significant differences are found within the CT groups or within the NCT groups. Thus, we can conclude that training in classification behavior increases the frequency of scorable responses. The hypothesis predicting significant differences between classification and non-classification training is supported, but as with grouping responses, the hypothesis predicting differences in effects of particular types of CT media has to be rejected.

Effects of Training on Discrepancy of Scorable Responses in the Active Condition

It was hypothesized that classification training will have a significantly greater effect on the size of the object-picture discrepancy than non-classification experience.

A significant chi square is obtained when CT and NCT groups are compared relative to an increase or decrease in the size of the discrepancy of scorable responses employed on the OCT and PCT ($X^2 = 4.4$, $p < .05$). More CT children decrease in the size of the discrepancy, thereby confirming the hypothesis (see Table 6).

The performance of the children within each experimental condition is of interest, indicating relative contribution of each condition (see Table 6).

Insert Table 6 about here

The table can be examined in terms of increase, decrease, or "no change" in discrepancy between the pre- and post- OCT and PCT. Each of the five experimental conditions has a different pattern.

As can be seen from Table 6, very few children increase in their object-picture discrepancy score for scorables. In fact, in the PT condition, not one child increases in size of the discrepancy. In NCT, each condition produces some increase.

Children who have had CT tend either to decrease in the size of object-picture discrepancy or show no change, whereas NCT results in inconsistency. Since decreases are relatively similar among the CT, but not among the NCT, particularly the VI and RP, it could be concluded that any of the CT conditions (objects, pictures, object-pictures) produce relatively similar outcomes. The picture condition does stand out, since, if it does have an effect, it reduces the discrepancy.

In sum, children who have experienced classification training decrease in the size of the object-picture discrepancy significantly more than NCT groups. Different trends are found among the various training procedures. With PT, the effect, _if any_, is to decrease the discrepancy.

Effects of Training on Styles of Scorable Responses in the Active Condition

Table 7 reveals significant shifts among CT children in terms of _color_ and _form_ on the OCT and PCT, but not so dramatic among NCT.

Insert Table 7 about here

This increase is due to two factors, first, a total increase in volume of responses, and second, an increase in the _number_ of children producing scorable responses. When the volume alone is examined, it is found that the proportion of each of the style types is consistent with the pretest. However, the percentage of children producing style responses within each category is greater for CT groups than for the NCT groups (see Table 8). For example, in the pretest OCT, 24% of the children used _form_, while in the posttest 52% used _form_, an increase 28%; in contrast, the NCT group increase from 12% to 28%, a change of only 16%. Similar differences are found for each of the other style categories. In effect, CT appears to increase the ability of _more_ children to produce _more_ scorable responses.

Insert Table 8 about here

Effect of Training on Variety of Styles Children Use in the Active Condition

Classification training involves experience in using a variety of criteria for building classes. The question now is, do the children in CT groups employ a wider array of styles in classification?

Chi-square analyses comparing number of children in the two training conditions using one or less and two or more style responses reveal consistent significant differences for the object condition ($X^2 = 4.36$, $p < .05$) and the picture condition ($X^2 = 11.68$, $p < .001$). In effect, there is more flexibility in employment of categories in the classification training condition than in the non-classification training condition.

Lest it be considered that this variation is a function of the low response pool of the subjects on the pretest, and thereby the so-called flexibility is in fact an artifact of the pretest level, let us examine the scores of the high responders only. The high responders, it will be recalled, are those children who in the pretest gave from 10 - 12, or approximately 80%, adequate responses, but within the same style of categorization. Analysis of the degree to which the children use more categories in the posttest condition would test the degree to which the training facilitated the use of more types of responses. The high responders who have had classification training are more variable, with 87.5% of them using two or more categories on the OCT, and 62.5% on the PCT. This is in contrast to the NCT where only 35.7% used two or more on the OCT and 35.7% on the PCT. There is more variability with this CT group than in the NCT group. In sum, classification training does affect the variability of classification criteria employed by the high responders, essentially inducing greater flexibility.

Differences between CT and NCT Groups in Use of Grouping and Scorable Responses in the Passive Condition

Another test of the ability of the children to group and provide adequate responses is their performance on the Passive Condition. It is expected that as a function of CT training, the children would be more able to provide labeling for preconstructed groups. Table 9 indicates that CT groups did significantly better in grouping performance and scorable responses for both the object and picture conditions. Thus, we can conclude that classification training does significantly influence the grouping performance and scorable responses.

Insert Table 9 about here

Comparison of CT and NCT Groups in Styles of Categorization Employed in the Passive Condition

In Table 10 are presented the mean number of style responses employed in the passive tests by each of the two training groups. Since this condition was administered only after training, no statements of pre-post change can be made. The CT groups employ more _form_ and _color_ responses than the NCT groups. It might be of interest to point out the relatively high use of _relational-contextual_ responses, a result not obtained in the active sorting condition.

Insert Table 10 about here

For both training groups, the distribution of response is similar in the object and picture conditions, indicating minimal discrepancy in terms of utilization of any one of these categories. Table 11 indicates that _more_ CT children use each of the style categories, whether objects or pictures are used. The frequency of use is as follows: color and relational-contextual responses, followed by form and categorical-inferential. Apparently CT enlarges the range of criteria children employ in a situation where the examiner constructs the groups.

Insert Table 11 about here

Effect of Training on Other Types of Representational Thinking

It will be recalled that it was predicted that experience in the CT condition would in general contribute less to representational thought than NCT training. But, among the CT groups, children trained with pictures would do the best.

The results are presented in Table 12. For the Haptic Task, the CT and the NCT groups improve equally. No significant difference is found between these two groups in the amount of change pre to post. However, if each training group is examined, those children trained in the PT and OPT groups did improve, but not the VI and RP groups. The NT group also made significant gains.

Insert Table 12 about here

For the Motor Encoding Task, the results are still different. Significant changes were found for each group, CT and NCT. However, within group examination reveals that those of the CT group involved in OT and OPT did improve, while those engaged in VI and RP did also. No significant change was obtained with the PT and with the NT. Training does seem to have an effect in facilitating motor encoding behavior, but virtually each kind of training is effective.

In sum, CT and NCT groups make equally significant gains in the Haptic and Motor Encoding Tasks. Thus, for these populations, the hypothesis that CT would be less effective than NCT is rejected.

Effect of Head Start on Classification Behavior

It was found that a number of the children had attended Head Start (HS). This provides an opportunity to determine whether this type of pre-kindergarten experience might have an influence on categorization behavior. It could be argued that the children who participated in the Head Start program would have had educational experiences relevant to classification skills and, consequently, would be more competent in producing grouping responses. Grouping responses were chosen because they are essentially classification responses, requiring the juxtaposition of objects. Comparisons of the pretest performance of the children who have had Head Start experience (HS) to those who have not (NHS) revealed that in fact the Head Start children did significantly better ($X^2 = 4.52$, $p < .05$).

Reexamination of the children in the posttest situation with the OCT and PCT revealed no significant differences in grouping responses between the HS and NHS. Thus, it can be concluded that previous experience did have an impact but that classification training as used in this study equalized the differences between the two groups. ✓

Sex Differences

In previous work with this categorizing task, sex differences in ability to perform were found. Consequently, it behooved us to examine the sex differences in pre- and posttest performance in order to ascertain the degree to which boys or girls differ, if at all, in their response to this training experience. Examining the discrepancy of grouping and scorable responses (i.e.

pre- to posttest), on the combined OCT and PCT, no significant difference between the sexes is found. Thus, it can be concluded that boys and girls profit equally from the training.

Discussion

The basic intent of this study was to assess the efficacy of various training procedures to enhance classification skills and representational competence.

✓

The results indicate that classification training does enhance the child's ability to employ grouping and scorable responses, as well as increase the variety of criteria by which to classify. Exposure to verbal experiences and role playing did not significantly alter classificatory skills.

Is the effectiveness merely a transfer effect, where the posttesting condition is very similar to the training? It should not be forgotten that the materials used in the training differed from those in the Categorizing Test. Also, the activities employed in training were very different from those in the formal test situation. Thus, the children demonstrate an ability to apply their newly acquired knowledge to a formal test situation, differing in content and task demands, attesting to their ability to generalize. This is indeed a goal of the training.

To be sure, the identical task was used in pre and post assessment. That the results obtained are not due to practice effects is demonstrated by the nonsignificant change among the non-classification training groups. The increase in grouping and scorable responses can not then be explained as a function of practice.

The results of the Passive Condition in the Categorization Tasks should also be kept in mind. Here the children were required to seek relationships of preconstructed groups. The fact that they could relate all items is an important step forward. That they used relational-contextual groupings along with color responses indicates an ability to seek out functional relationships--a criterion used infrequently in the Active Condition.

Finally, the increase in variety of styles of categorization reflects an increasing ability to employ alternatives. This move away from a limited single emphasis suggests that the children can and do seek alternatives--perhaps a step toward flexibility.

It can be concluded that the type of classification training employed in this study is a means by which classificatory skills can be induced.

Of particular interest is the fact that a guided discovery teaching strategy was used with these lower-class Negro children. Evidently they do have a repertoire from which to build. Providing them with an appropriate environment for utilizing already established skills seems to enhance acquisition of additional knowledge.

In addition to cognitive gains, the teachers report that children in the CT groups showed increased verbalization in the classroom, evidenced a more positive attitude toward school and showed greater interest in their school environment. They also asked more questions about objects and events in their surroundings. These gains were not reported by the teachers of the verbal-interaction and role-playing groups. Since all teachers appeared enthusiastic about their particular training experiences with the children, one would be hard pressed to attribute these gains solely to teacher bias.

The object-picture discrepancy is another major interest of the project. It will be recalled that no significant change in the size of this discrepancy was found for grouping responses. However, significant decreases in this discrepancy were found for scorable responses. The object-picture discrepancy referred to above is consistent with previous findings (Sigel, Anderson, Shapiro, 1966; Sigel, McBane, 1967). In view of this replication, there is little doubt as to the validity of the phenomenon.

None of the training conditions in this study, however, could significantly reduce the size of the discrepancy for grouping responses. Since the children were exposed to pictures and to objects, separately and in sequence, it was surprising to find no reduction in the discrepancy. It could be argued that the discrepancy is due to the fact that objects and pictures represent two classes of stimuli and thereby provide different sets of cues. Granting there are these differences, there is reason to expect consistency across such stimuli, particularly when they are representative of the same content. Middle-class children of preschool age do not show this discrepancy (Sigel, Anderson, Shapiro, 1966; Sigel, McBane, 1967). Also, Sigel found no difference for older lower-middle-class children (Sigel, 1953). The results of these previous studies point to the uniqueness of these findings for lower-class Negro children, suggesting the discrepancy may well be due to cognitive deficits and not to differential cues in the two sets of stimuli. For lower-class children, mode of representation makes a difference. The reason for this phenomenon is unclear, and all that can be offered at this point is speculation.

To treat objects and their representative counterparts as equivalent requires a concept of the object and an awareness that objects can be represented in any number of ways. Since the children could apply the appropriate label to the picture indicates that on the naming level the children recognize the item. Why, then, does this knowledge not permeate classification behavior? Since naming is not enough, what is? Theoretically, it can be postulated that the child does not have the schema of the object--he needs a greater range of cues in order to use the object when represented pictorially. Perhaps more salient, again theoretically, is the child's lack of competence in symbolic and representational thought in general--herein manifested in this particular set of behaviors. How significant are these types of behaviors in the lives of these children? How much symbolic and representational thought is found in their environments?

Answers to these questions may reside in further study of the symbolic environment of these children. If the adults create an environment which tends to be nonsymbolic, it is not surprising to find limited symbolic competence among the children. Examination of the linguistic environment of these children with particular emphasis on the quality of language used, may well provide some answers. This will require more details of linguistic interaction than suggested by Hess and Shipman (Hess, Shipman, 1965). One should examine the frequency with which parents employ such things as relational terms, qualifiers, referents to the non-physical. Among these may be the type of language units that are lacking in the lives of these children. But more important is the quality of even such seemingly abstract terms--are they sufficient to help foster an abstract attitude.

Search must be made of the relevant cognitive dimensions as they are embedded in a more complex personal-social system. Categorization requires an ability to objectify, to disengage relevances, etc.--behaviors closely allied to the affective domains of the person. Further, the requirement to acquire a concept of the object, thereby identifying it under various guises (pictorial, linguistic, etc.) may be a function of these larger issues.

The significance of the findings of differential classificatory behaviors with objects and pictures may rest in the identification of the broader questions regarding the requisites for dealing with symbolic materials at all levels.

Appendix A

Administration of Categorizing Test

Materials:

(In order of presentation to the child)

(1) MATCHES (M)	(2) BLOCKS (Bl)	(3) SPOON (S)	(4) PENCIL (Pe)
(8) NOTEBOOK (NB)	(7) CUP (C)	(6) PIPE (Pi)	(5) TOP (T)
(9) BALL (B)	(10) CIGARETTES (Ci)	(11) CRAYONS (Cr)	(12) BOTTLE OPENER (BO)

A set of colored pictures of these same twelve objects (presented in the same order).

Procedure:

I. Identification Task:

A. Say to the child: "I have some things here than I am going to put on the table. Tell me what they are."

The objects (or pictures) are placed in front of the child in the order indicated above, the matches in the upper left hand corner of the child's view. The name that the child uses is written on the answer sheet. If the child cannot give you a name, ask him to describe what it does or how it is used, and record the description. Do not give the child a label if he lacks one. If he gives the correct label you may just make a check mark.

II. Active Sort:

A. Pick out the pencil from the array (leaving the other items in the above order), put it over to the side and say to the child:

a. "Look at all these (indicate total array of objects or pictures) and put over here the ones that are the same or like this one."

Circle on the score sheet the items that the child selects, and ask him:

"Why are these the same or alike?"

Record the answer verbatim, and put an "a" to indicate he responded to Question a.

If child does not respond to the above (a.), say:

b. "Look at all these and pick out the ones that belong with this one."

Circle the items he selects and ask:

"Why do these belong together?"

Record his answer and indicate that he responded to Question b.

If child does not respond to the above (b.), say:

c. "Put over here the ones that do with this one."

Circle the items he selects and ask:

"Why do these go together?"

Record his answer and indicate that he responded to Question c.

Return the pencil to the array and repeat the procedure with the ball.

Continue this procedure for the 10 remaining items in the following order: Cigarette, crayons, bottle opener, top, pipe, cup, notebook, matches, blocks, spoon. (You will note that the order for the 12 items is upper right to lower left, through the lower right, then middle right to middle left, then upper left to pencil.)

On the first two items (Pencil and Ball) if the child picks one item E should ask: "Are there any other?" If the child does not respond he is encouraged with: "See if you can't find something here (pointing to the array) that is like (belongs with, goes with) this one. (Pause) Go ahead, pick one." If these prompts are used, note it in the answer space.

After the first two items just accept whatever the child says, including "don't know" or "nothing." The one exception to this is if the child responds with an association to an item which is not present, e.g. if he says "goes with beer" when the bottle opener is the stimuli. In that case you may ask: "Do any of these?"

III. Passive Sort:

A. After the child is questioned on all twelve objects (and they are again in the original order) E selects out three items (see score sheet for items and order) and asks:

a. "Tell me how these three are the same or alike."

If no response then E asks:

b. "Tell me how these three belong together."

If no response then E asks:

c. "Why do these three go together?"

Record the child's answer verbatim. If he uses only 1 or 2 of the items given him, be sure to indicate which ones he is talking about.

Scoring Manual -- Categorizing Test

General Rules:

(1) NOTE: Remember to check to make sure that responses are correctly recorded and make sure that the stimulus is not also counted as an item selected.

(2) If two verbal responses to a given sort of stimuli are equally good, but different, use the first. Always score the highest possible of multiple responses.

(3) If the child initially mislabels an item and consistently uses that label, accept it and score his responses within the context of that label: e.g., if he calls the top a sharpener and selects the pencil to go with it, saying that you sharpen the pencil with it, score as appropriate R-F. Only initial unusual labels are accepted.

Each response made by the subject will be scored for two aspects, the verbal level of the response and the type of classification used.

Verbal Level:

Grouping Responses:

Grouping responses are those in which a meaningful relationship between all of the items grouped is given. There are three types:

1) Appropriate --All items sorted from the stimulus array must be included in a fully articulated response. A fully articulated response must include a categorical label or the labels of all items included in the sort together with a connecting relational or functional verb. A pronoun will be accepted as a substitute for the item label(s) if the referent of the pronoun is unequivocal: e.g., "they are all yellow."

2) Additional --If the child gives a verbal response which does not fulfill the criteria for full articulation, but through implication expresses a unifying concept, score as an Additional. Such implications may be assumed when a single verb represents the function of all the items. When the action attributed to one of the items needs, or is commonly associated with, the presence of the other item(s) for its execution, the implication of a relationship may be assumed since the child has selected these items from the matrix. Further implication may be assumed when the cue is non-verbal, that is, when the basis for categorization is not clearly verbalized but only clarified by the use of gestures.

3) Labeling Error--Here the child has made a grouping of items which are, in fact, similar, but gives the incorrect label for the grouping: e.g., puts blue items together and says, "they are all yellow."

Nongrouping Responses:

Nongrouping responses are those in which an answer is given and its meaning is clear but it does not meet the task requirements. There are five types:

1) Partial and Disjunctive 2 --Of the items sorted, if one, or more, is not included either in the verbal response or through pointing, then score the response as a partial.

Disjunctive 2s are responses in which the subject uses at least one basis of categorization which has two or more items contained in it and other bases for the remaining items. Thus, DJ 2s are responses which consist of two or more smaller groupings of the items chosen.

2) Disjunctive 1 --Here the child assigns a different attribute, use, or owner to two or more of the objects picked: e.g., "you play with the blocks, smoke a cigarette and drink from the cup," or "this is yellow, this is white, this is blue."

When items have a common cultural usage, e.g., matches and pipe, but the verbal response clearly indicates a separate function (matches are for lighting, pipe is for smoking) then the response is not scored as Additional, but as Disjunctive 1.

Also, responses which show an associative difference between two or more items (this is blue and that is not blue, or this is taller than that) should be coded here.

3) Single Associations --Single associations are responses in which the subject gives a reasonable appropriate association or an aside to just one item selected: e.g., "my mother has a bottle opener" when the stimuli are the opener, the cup and the spoon.

For 1) and 2) above, when more than one classification category is used in the response, use the category given first.

4) Grouping Error--Grouping errors are erroneous verbalizations, e.g., "they're made out of sponge" or "white" when they are not.

5) Irrelevant and Idiosyncratic--These responses include such things as (1) color responses using the backgrounds or shadows of the stimuli, (2) contextual groupings which are merely piling: e.g., "put the ball in the cup," or "put the pipe on the blocks," and (3) thematic response where the items are related in a story but not in any meaningful way.

Scorable Responses:

Scorable responses include grouping responses and nongrouping responses.

Nonscorable Responses:

Nonscorable responses are those in which an answer is not given or is not clear enough to score. There are two types:

1) Insufficient information --This category includes the following:
(1) Subject gives a response, but not enough to know what he means: e.g. "these are big," used indiscriminately,
(2) subject merely names the objects,
(3) subject says, "I don't know," and
(4) subject merely repeats or paraphrases the question: e.g. "they are the same," or "they belong together."

2) No Choice --The subject selects no item to do with the stimulus.

Classification:

All grouping and nongrouping responses of the child are scored in one of the four categories following:

1) Descriptive --Organization of the stimuli on the basis of perceptual physical properties is scored as a descriptive response.

form --The use of measurement or shape properties, such as round, flat, long, small, fat, corners, is scored as a form response: e.g. "they are all long."

color --Use of a color label, or saying "same color" is scored as a color response.

structure --Designation of specific intrinsic or inherent parts or properties such as metal, wood, having writing on them, having similar parts like handles, knobs, etc., is a structure response.

2) Relational --Responses in which the stimuli are organized as interacting with each other or being found in the same context are scored as relational.

functional --When the action of the functional relation takes place directly between the items in a given sort, then the response is recorded as relational-functional: e.g. "light the cigarette with the matches."

thematic --When the action of the functional-relation between the items in a given sort takes place on an imported item, then the response is recorded as relational-thematic: e.g. "open the pop with the bottle opener and drink it out of the cup."
Also code as thematic those responses in which the objects are related in story sequence but their function is not otherwise interrelated: e.g. "smoke a cigarette while you drink a cup of coffee."

contextual --In responses where objects are solely grouped because they are found in the same location, or belong to the same person, score contextual: e.g. "my daddy has those," or "they are in the kitchen."

3) Categorical --Organization of the stimuli on the basis of common class membership, including atypical class membership is the basis for a categorical score.

low functional--One object or picture is chosen to be with the stimuli because both are used for the same purpose: e.g. "you write with them," or "you play with them," or inferred action properties such as rolling or spinning.

high functional--Two or more objects or pictures are chosen to go with the stimuli because all are used for the same purpose or inferred action properties such as rolling or spinning.

class label --One term is used to define two or more items included in the class: e.g. "toys," or "kitchen things," or "writing things."

4) Unusual/None --Grouping and nongrouping responses are scored here if the basis of relationship is unusual: e.g. "smash the cigarette with the blocks." All nonscorable responses are placed in this category also.

Descriptive-Form:

The following adjectives are considered to accurately describe the form of the object:

Matches	Flat,* straight, square, corners
Blocks	Flat,* straight, square, corner, round,** fat***
Spoon	Flat,*(Handle), straight (handle), round (bowl)
Pencil	Long, round, straight, pointed, flat*
Top	Round, fat
Pipe	Round, flat,* straight, long
Cup	Round, fat
Notebook	Flat,* square, corners, straight, long
Ball	Round, fat
Cigarettes	Round, long, straight, flat*
Crayons	Flat,* square, corners, long, straight
Bottle opener	Flat,* long, pointed, straight, round

* Flat may be taken to mean either:
a) a flat surface, or
b) a lack of height

Pointing is necessary to indicate flatness meaning resting on a surface.

** Pointing to the round letters on the blocks is necessary to indicate roundness.

*** Fat may be taken to mean massive or having height and width.

Sigel
Olmsted

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Appendix B

HAPTIC TASK
Instructions

1. Demonstrate curtain to child by rotating it, indicating it is merely a screen.

2. Place screen on table so that child can completely extend his hands through curtain. Lift up curtain to show child there is nothing on the other side.

3. With curtain down, tell child to put hands through screen. As you place the airplane in his right hand, say:
   "I am putting something in your hand. Feel it all over because I will want to find out if you know what it is. When you think you know what you are feeling, say, 'Ready.'"

4. Remove object after child says, "Ready," but do not show it to him. Now say:
   "Tell me what you were feeling."
   After he replies, show him the airplane.

5. Now say:
   "We are going to play a game feeling more things. Place your hands under the curtain."
   As he does this, say:
   "I am going to put something else in your hands, and feel it all over. When you think you know what it is, say, 'Ready.'"

5a. Time the latency between presentation of the object and the child's statement of ready.

5b. Be sure to always place object in the right hand.

6. Note how child handles object behind the curtain. The following categories will be used:
   a. HOLDING: Simply grasps in one or both hands, but no movements.
   b. TURNING: Rotates in one or both hands.
   c. EDGING: Runs one or both hands at least 1/2 way about object.
   d. TOTAL: Tries to discover all the features of object--sides, number of points, etc.
   Place appropriate letter of type of behavior in answer box.

7. After child indicates he is ready, remove object, and say (as you bring out either the placard or the object):
   "I am going to show you some _______ (pictures) or (things). Point to the one just like the one you were just feeling behind the curtain."

8. Check box indicating choice. Now say:
   "Let's go on to another."

9. Repeat procedure with remaining nineteen items.

Thank you.

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Appendix C

Teaching Procedures in the Concept of the Object and Classificatory Competence [*]

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The aim is to enable the children to label the object, the constructural and functional properties, and the class membership, and to help develop skills in classification and categorization.

The teacher's goal is to help the child become aware of the many characteristics of each item, to learn that objects are similar or different on the basis of any one or more characteristics, and that since there are many ways to classify, there is no one right way.

Even though there are many right ways, there are ways which are indicative of (1) no awareness of classification; (2) some awareness, but where groupings are idiosyncratic and do not reflect logical or communicable orderings; a group selected and the child says, "I don't know," or "I wanted to," etc.--these kinds of collections are indicative of a lack on the part of the child to deal with objects objectively; (3) awareness of groupings and an apparent, deliberate, planned organization; (3a) no verbalization but communicable gestures; (3b) the ability to express a rationale for the collection verbally.

Children at any level may make certain errors in labeling items, and we must distinguish between such errors, e.g. calling red green, or other misnaming, and inaccuracy due to apparent information deficit. These should be distinguished from inability to grasp the process of grouping and viewing reproduction with "objectivity."

In this experiment, the major aim is to test the impact of particular training procedures in increasing classificatory skills by helping the child realize objects are complex and can be viewed from a number of points of view.

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One way objects are represented is as pictures--signs of the objects. The discovery that lower-class children had difficulties in treating pictures as signs of objects, suggested a difficulty in representational behavior--a finding supported by other studies. These children were found to have difficulty in other areas requiring representational ability, e.g. abstracting, pretending, in effect--in imagery in general.

In our view the two intellectual activities of classification and representational thought are interdependent, since classification requires analysis of the observable, inferences about possible relationships between items, and constructing integrated relationships in larger categories.

To "know" an object in order to form these categories, the object should be recognized in its three-dimensional form or pictorial representations of it.

To provide the child with situations in which he will get to know the object in the sense described above requires motoric and linguistic experiences with objects; motoric in terms of knowing how it feels, what it does, and what can be done to it--a hammer is used to pound things and to use a hammer there are a number of necessary motoric acts. The child has to learn to name the object and its relevant characteristics. Once he has accomplished these tasks, he is now assumed to be capable of dealing with the object in its various guises and forms.

These then are the goals of this study. Since we are not certain what the best ways are to accomplish the goals, we are establishing a series of training procedures to test the efficacy of a number of training techniques. Three of these procedures involve training in identifying the extrinsic and intrinsic functions of objects, labels for various attributes, and perceiving similarities and differences among objects as bases of classification.

The three procedures dealing directly with object identification and classification are involved in the following three experimental conditions:

1. Object condition
2. Picture condition
3. Object-picture condition

For each of the three conditions, items (objects and/or pictures) will be identified, attributes labeled, and functions expressed motorically and verbally. Thus, for example, if a pen were introduced, it would be labeled "pen"; it would be described by attribute labeling, e.g. color, size, texture, shape, etc.; by function, motoric, e.g. holding pen in writing position, writing with it; and verbal description of actions, i.e. you write with it, you carry it, etc.; by class membership, e.g. writing things, tools, etc.

The only difference with the picture condition is that actions will have to be pantomimed, pretending the object is being handled. The verbal conditions are the same as in the object condition.

There are two parts to the training in the object-picture condition; first, objects are discussed, and then, pictures of these objects are used. Only half of the items used in the other two conditions are included in this one.

In sum, the experiment is aimed at determining the most effective intervention procedure for increasing knowledge of the objects and competence in classification.

Section II

Materials:

The materials used in the object and/or picture training conditions are realistic three-dimensional items and photographs of them. The items can be most simply and obviously identified with the following class labels: wearing, musical instruments, containers, washing, fasteners.

Many other categories can be created from these materials and by the end of the training no doubt many different categories will be developed by regrouping the materials.

The list of items follows:

Object Condition and Picture Condition

- Wearing: Shoe, shirt, sock, tie, hat, glove, watch, bracelet, umbrella, belt;
- Musical instruments: Bell, drum, maracas, accordian;
- Containers: Can, drinking glass, box, glass jar with lid, wallet;
- Washing: Towel, sponge, soap, soap dish;
- Fasteners: Zipper, button, safety pin, clothes pin;
- Miscellaneous: Flashlight, eye glasses, mirror, a quarter, scissors.

Object-Picture Condition

Wearing: Shoe, shirt, glove, bracelet, belt;
Musical instruments: Bell, maracas;
Containers: Box, glass jar with lid, wallet;
Washing: Towel, sponge;
Fasteners: Zipper, button, safety pin;
Miscellaneous: Scissors.

Section III

A. General principles:

1. Sessions should be teacher guided to allow for spontaneous verbalizations.
2. All categorical responses should be accepted. If in error, have the children correct if possible. If not, query children to elicit corrections by child where possible. Do not show preference for one response over others.
3. Follow order of introduction of materials to keep sessions in different schools compatible.
4. Questions to be covered as objects are presented:
    (1) What do you call it?
    (2) What does it look like?
    (3) What do you do with it? ...to it?
    (4) What other things are like it?
5. Prior to formal grouping, search tasks:--searching for similarities and differences will be guided by teacher by requests to discover common characteristics, e.g. all red, all soft, all cloth, etc. This is a search for similarities. Also search for comparisons, e.g. all red ones here, all green ones here, etc.
    The goal is to have the child discover (through search and discovery) the common attributes, build groups, then rebuild them. In this way the child will learn that the same object can belong to different groups--each of them correct.
6. Spontaneous grouping games should be used in which the child is asked to put out "those things that are alike or go together."

Reasons should be elicited with the rest of the children joining in when possible to (1) verify, (2) elaborate if possible. Whenever this is done, accept statements from all. Try to let group do the _verification through confrontation_.

Probe Questions

What do we call this?
What do you call it?
What color is it?
What is it made of?
Where does it come from?
Where do you find it?
What does it look like?
Who uses it?
How does he (she) use it?
What can you do with this?
Show me how you use it.
Show me what _you_ do with it.
Child acts out with it.

Category 1 -- Wearing *

1. Present shoe to group
2. Identification:
    Who knows what this is?
    If correct, say, "Yes, this is a _shoe_."
    If incorrect, say, "This is called a _shoe_."
    Whether correct or incorrect, after term is used, ask each child to say, "It is a _shoe_."
3. Be certain each child knows name, say, "Now we will talk about the shoe. What can you tell me about the shoe?" (Here the goal is to obtain _attributes_ as follows:

---

*The following procedures are for the object condition and picture condition. The same procedures apply for the items of the object-picture condition.

(1) brown (color)
(2) wear it (function)
(3) has laces, heels, soles, etc. (structure)
(4) is leather (material)
(5) for boys (relational)
(6) buy it in store (relational)

Actions of two types:

(1) What the object does--bend it
(2) What can be done to object--wear it, carry it, fill it, etc.

4. After attributes and actions are identified, compare shoe to children's shoes, teacher's shoes--pointing out differences and similarities. Goal here is to allow for comparison to other items in the class (teacher's shoes, children's shoes). Allow each child to participate.
5. After you feel children have completed "shoe", remove and bring in shirt. Repeat procedure in steps 2, and 4, but for 3 introduce with question, "What do we do with this?" The aim is not always to introduce items by descriptive terms. The point is to avoid a particular set or order, but get the point across that a variety of characteristics can be emphasized.
6. Bring shoe back and now identify differences and similarities between shoe and shirt. In this case attributes, functions, actions are to be viewed comparatively, e.g. difference, shoe brown, shirt blue; similar, wear both.
7. After these have been investigated, remove objects and introduce sock. Repeat steps 2, 3, 4.
8. Remove sock and introduce tie. Repeat steps 2, 3, 4.
9. Bring sock and tie back, repeat step 6--comparison.
10. Bring back shoe, shirt, sock, and tie. When returning each item to table ask children to name each item as it is being introduced.
11. With four objects now on the table emphasis should be on grouping items in pairs, starting with simplest attribute--color. Put out the ones that are "red." Pick out the ones that are "blue." Reorganize these two subcategories so that now shirt and shoe can be grouped and sock and tie. Regroup so that all four can be grouped. Do not exhaust all possibilities, yet be certain children know at least 2 ways all four can be classified.

12. Remove all these items, and introduce hat and glove together. Now each item will be described singly and together, e.g.
    a. Name: hat, cap
    b. Name: glove
    c. How similar? What do you do with these when you wear them? (seasonal)
13. Now introduce all items heretofore used, a total of 6.

    During this period change pace with increased games:
    (1) Hidden game
    (2) Show and tell
    (Here we shall work out with teacher)
14. After classes have been combined and recombined, attributes identified, etc., all objects are still on table, the watch is brought out and the child is asked, "What is this? Does it go with anything here?" Goal here is to see how the child relates a difficult yet relevant item to any one or more (can use sub-groups, etc.). After the watch, introduce bracelet, belt, and finally umbrella.

    After umbrella, all items should be on the table. Some additional grouping games can be played.

Category 2 -- Musical Instruments

1. Present maraca to group
2. Identification:
    a. Pass object or picture to each child to examine before asking probe questions.
    b. Ask, "What is this called?"
    Have each child say the name. (May call it a "shaker" or some other names suggested by the children.) Teacher should supply the correct name but continue to accept child's term.
3. "Now we will talk about the maraca. What can you tell me about the maraca?"
    Possible attributes (not a complete list):
    (1) blue or green (color)
    (2) makes noise (function)

(3) has handle (structure)
(4) is wood (material)
(5) but it in a store (relational)
Action with the objects.

4. Bring back bracelet, umbrella and watch and identify differences and similarities.
5. Remove bracelet, umbrella and watch. Allow maraca to remain.
6. Introduce bell, drum and accordian together. Discuss the items singly and together (see item 12, page 7).
7. Group and regroup with all four musical instruments.
8. Suggested activities and games with the musical instruments:
    (1) Explore the noises these instruments can make. Have children close eyes, teacher or one of children plays instruments. This may be done with the pictures by imitating the sounds orally, but all must agree on sounds before playing the game.
    (2) Select a child to tell or pantomime a way in which the object (or picture) might be handled or used. Accept many ways in addition to the obvious ones such as beating drum, ringing bell. For instance, a child may indicate shape or size with his hands or may try to "look like" the object itself through whole body movement.

Category 3 -- Containers

1. Present can, glass and jar together.
    a. Name objects.
2. Attributes:
    a. What is it made of? How does it feel?
    b. What can you do with it?
        1) Try to include sounds (carry-over from musical instruments)
        Example: Tap objects with finger or against each other. Speak into object.
        With pictures--discuss possible noises or sounds objects might make.
    c. How can you use it?
    d. What could you put into it?

3. Differences and similarities
    a. All containers
    b. Jar and glass are glass. Lid and can are metal, etc.
    c. Shape
    d. Size
4. Set aside can, glass and jar, but do not remove from view. Bring in box and wallet.
5. Follow steps 2 qnd 3 above.
6. Return all 5 objects and classify as previously.
    a. Game suggestions:
        1) Have child pantomime use of an object while others guess
        2) Teacher removes two objects while children have eyes closed. Children recall the missing objects.
    b. Ask children to tell how they might use any 2 objects together or successively. Let child choose the objects he wishes to tell about.
       Examples:
        1) Pour something from jar or can into glass.
        2) Put wallet into box.
        3) Take wallet to the store and buy can of juice.

Categories 1 & 3 -- Wearing and Containers

1. Present can, glass, box, jar, wallet, shirt, shoe, watch, tie.
2. Have children briefly recall some of the discussion about these objects.
3. Classify as before.
    a. May bring in more difficult concepts in addition to those which children suggest.
       Examples:
        1) Pick out all things with metal on them--lid, watch, tie, shoe lace holes
        2) Pick out all breakable things. Have children describe how things might break.

Category 4 -- Washing

1. Introduce towel, sponge and soap
   a. Name objects
   b. Investigate objects singly and together. Pass them.
2. Discuss attributes
   a. What does it feel like? -- hard, soft, smooth, rough, etc.
   b. What is it made of? (Possibility of children bringing up real sponges. This one is cellulose.)
   c. Where could you find it?
   d. How could you use it?
   e. Color
   f. Shape
3. Before classifying, bring in soap dish (apt to be less familiar to children). Follow steps 1 and 2.
4. Put all objects together and classify--differences and similarities.
   a. Shape--towel, sponge and soap dish are rectangular, (soap?)
5. When children are completely familiar with objects remove them or, for pictures, turn them over. Ask children to close eyes and "see a picture in their heads" of one of the objects. Children describe these things--color, size, what were you doing with it, etc.
6. How could you use any two or three objects together or successively?
   a. Example: Put soap in soap dish or wash with soap, then dry with towel.

Categories 3 & 4 -- Washing and Containers

1. Before displaying objects or pictures, ask children if they can remember those shown yesterday or the day before. As they name them put objects on table. If they cannot recall all of them, teacher may add one at a time asking children to name them as she does so.
2. Have children recall briefly some of the previous discussion about these objects.
3. Classification
   a. Group and regroup
      1) Keep probing for additional differences and similarities beyond those obvious to children.

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Example: Towel could become a container by wrapping something in it.
Or: Glass, jar, wallet, soap and soap dish all feel smooth.

4. Other activities:
    a. Each child selects an object or picture and holds it under the table. He describes it and the teacher tries to guess which one he has.

Category 5 -- Fasteners

1. Introduce zipper and safety pin
    a. Name objects
    b. Pass to children
2. Discuss attributes
    a. Where do you find it?
    b. What color is it?
    c. What is it made of?
    d. What does it feel like?
    e. What does it look like?
    f. What can you do with it?
    g. Try to include sounds, e.g. click of zipper or pin, snap of clothespin.
3. Remove zipper and safety pin. Present button and clothespin.
4. Follow steps 1 and 2.
5. Bring back zipper and safety pin with button and clothespin.
6. Classify
    a. Differences and similarities
    b. Group and regroup
        1) Suggestions: Zipper, pin and clothespin all have metal.
        Clothespin and button are plastic.
        All are fasteners.
        All open and close, etc.
7. Activities:
    a. Rearrangements
    After children have grouped objects, have them close their eyes while teacher removes one item from group or changes the arrangement by moving one or two objects. Children open eyes and teacher asks, "How was it changed?"

b. Using button and zipper and perhaps safety pin: Child chooses an object (Example: zipper) and presents it to another child who is wearing something similar (Example: skirt with zipper). Child tells about what he is doing (Example: "I'll give the zipper to Nancy because she has a zipper on her skirt.")

Categories 2 & 5 -- Musical Instruments and Fasteners

1. Present safety pin, zipper, accordian, and bell.
   a. Name objects.
2. Have children briefly recall some of the discussion about these objects.
3. Classification
   a. Differences and similarities
   b. Group and regroup
      1) All have moving parts
      2) Pin, zipper and accordian can be opened or closed
      3) Pin, zipper and bell all have metal, etc.
4. Bring in drum, maracas, button and clothespin.
5. Follow steps 1 and 2.
6. Working with all 8 objects, follow step 3.
7. Activities:
   a. Larger and smaller:
      1) Child selects one object and compares it to others. He says, "The drum is larger (or bigger) than the button." He may try to find as many objects as he can which are smaller or larger than the one he has chosen.
   b. Remove all objects or pictures from view. Ask child to describe by recall one of the objects. Others guess which one he is describing. The child who guesses then gets to hold the object or picture. Children take turns.

Category 6 -- Miscellaneous

1. Present scissors
   a. Identification
   b. Permit children to pass scissors from one to another.

1) Attribute of sharpness may be brought out here. Ask children to suggest a good way to pass or handle scissors. Ask why they suggest a particular way.

   For objects: It is important that the children know from the beginning that the scissors are quite sharp so that they will handle them safely. Do not insist that they hold them in any particular way since this would limit investigation. However, if they are aware that they might get hurt or hurt someone else, they will handle them more carefully.

2. Attributes
   a. What does it do?
   b. How could you use it?
   c. Who else might use it?
   d. What is it made of?
   e. Color?
   f. How does it feel?
   g. Where can you find it?
3. Set scissors aside but remaining in view.
4. Bring in flashlight, eye glasses and quarter.
5. Follow steps 1 and 2. Discuss items singly and together.
6. Return scissors to group.
7. Classification (may be more difficult than previously because of miscellaneous category).
   a. Differences and similarities
   b. Group and regroup
      1) Suggestions:
         a) Glasses and flashlight both have glass and plastic.
         b) Flashlight, quarter and scissors are silver, metal.
         c) Flashlight, quarter, glasses and scissors have round parts.
         d) All but quarter have movable parts.
8. Activities:
   a. Pantomime: A child pantomimes use of object while others guess what it is.
   b. Ask child to select an object or picture and describe a situation in which he might need it. Have him tell how he would use it. Example: "If I wanted some candy, I could buy it with the quarter."

c. Over and under: Child selects an object and holds it over or places it beneath another object. Then he says, for example, "The scissors are over the flashlight."

Categories 1, 2 & 4 -- Wearing, Musical Instruments and Washing

(not previously combined 19 items)

1. Put objects or pictures on table one at a time but mix up the categories, e.g. vary the order of presentation of objects, choosing one from category 2, then one from category 4, then one from category 1, for example.
2. As each one is presented have the children name it.
3. With all items on the table classify as before.

r. Activities:
   a. Ask one child to select 3 objects which might belong together and have him tell why. Accept any reasonable answer. Example: shape, color, use, etc.
   b. Ask children to pick out as many objects as they can find which have red on them. Do the same with other colors.

Categories 3, 5 & 6 -- Containers, Fasteners and Miscellaneous

(not previously combined 13 items)

1. Follow steps 1, 2 and 3 of previous lesson (categories 1, 2 & 4).
2. Activities:
   a. Ask children to close their eyes. Remove two or three objects. Children tell which are missing.
   b. Ask children to select all objects with metal on them. Do the same for glass, plastic, etc.

It may well be that the answer lies in some integrating mechanism, the creation of organized wholes. Other training procedures than those employed here are necessary. Perhaps, with the type of classification training used in this study as a basis, additional experience indicating relationship between different forms of the same item would enhance symbolic competence.

That scorable responses increased as a consequence of training should be no surprise. The CT group did have considerable experience in labeling and giving descriptive statements about objects. This is in fact what most scorables are, posing little challenge to classification skills.

Obviously, just verbalization is not the key, since the verbal interaction group did not increase significantly in the number of scorable responses given. It apparently has to be verbal interaction in a structured context. This describes the CT condition--discovery within a predetermined system. The child had to focus on materials at hand which restricted the range of choices he had. Granted the items are complex--having multiple attributes--still there is a limited number of object characteristics. Then children then have a frame of reference within which to search. This aspect of the training should not be overlooked as a significant factor contributing to the outcomes of the study.

A number of other issues arise from this study that need further investigation. Among these are the sex difference in response patterns, the stability of the training outcomes and their relationship to other intellectual areas.

If, however, the significance of classificatory skills is granted, then this project has contributed a procedure which is practical and can be implemented in the kindergarten.

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Footnotes

1. The Passive Condition was not used in the pretest, since in previous studies this condition was found to be too difficult (Sigel, McBane, 1967).

2. Mrs. Ralle Rothman was responsible for devising this aspect of this particular curriculum guide.

3. The data and results of this element of this study will not be included here but will be presented in another report.

Table 1

Number of Children Included in the Different Experimental Conditions

	Ns		
Group	LR	HR	Experimental Condition
CT			
OT	8	2	Object Training
PT	6	4	Picture Training
OPT	11	2	Object and Picture Training
	25	8	
NCT			
VI	7	6	Verbal Interaction
RP	7	3	Role Play
NT	11	5	No Training
	25	14	
	50	22	

LR = Low Responder

HR = High Responder

Table 2

Means and Standard Deviations of the Grouping Responses for Pretest, Posttest and Pre-Posttest Discrepancy of the Low Responders in Each Experimental Condition

			Pretest		Posttest		Pre-Posttest Discrepancy	
	Group	N	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
CT								
	OT	8	5.6	4.9	19.8	2.6	14.1	4.6
	PT	6	3.0	2.8	20.2	3.0	17.2	5.1
	OPT	11	4.4	3.6	19.1	4.6	14.7	5.0
							$\bar{X}$ 15.1	
NCT								
	VI	7	1.9	2.7	8.9	9.3	7.0	9.4
	RP	7	3.3	4.3	8.6	7.5	5.3	5.2
	NT	11	7.6	4.1	12.9	7.1	5.3	6.8
							$\bar{X}$ 5.8	

Analysis of Variance of Discrepancy in Number of Grouping Responses from Pretest to Posttest

Source	df	MS	F	p
Groups	5	229.0	5.24	< .01
Error	44	43.7		

Table 3

Changes in Discrepancy between Number of Grouping Responses Given on the OCT and PCT Tests from Pretest to Posttest for Low Responders in Each Experimental Condition

Group	Increase	Decrease	No Change
CT			
OT	37.5	37.5	25.0
PT	33.3	50.0	16.7
OPT	36.4	36.4	27.2
NCT			
VI	42.8	28.6	28.6
RP	28.6	14.3	57.6
NT	36.4	36.4	27.2

Table 4

Mean Number of Grouping Responses in Each Category Style for the Pretest, Posttest and Pre-Post Discrepancy for the OCT and PCT Tests for Low Responders in Each Experimental Condition

Group	F	Co	R	Ca	F	Co	R	Ca
	Pretest OCT				Pretest PCT			
CT								
OT	--	1.4	--	--	0.2	3.8	0.1	--
PT	0.7	1.2	--	--	0.2	0.8	--	0.2
OPT	0.9	1.2	0.7	0.4	0.4	0.2	0.6	--
NCT								
VI	--	--	1.1	0.6	--	--	0.1	--
RP	0.1	1.4	0.6	0.1	--	0.7	0.3	--
NT	0.9	2.8	0.1	0.1	1.4	1.6	0.1	0.2
	Posttest OCT				Posttest PCT			
CT								
OT	2.6	6.8	0.5	0.5	1.0	7.4	0.8	--
PT	3.5	4.3	1.2	1.3	3.7	2.8	2.2	1.2
OPT	2.3	5.4	0.9	0.1	2.3	4.3	0.8	0.8
NCT								
VI	1.6	1.0	1.6	0.4	1.7	1.0	1.4	0.1
RP	0.1	3.7	1.1	0.3	--	2.1	1.1	--
NT	2.0	3.0	0.6	0.6	2.3	3.2	1.1	0.1
	Discrepancy OCT				Discrepancy PCT			
CT								
OT	2.6	5.4	0.5	0.5	0.8	3.6	0.7	--
PT	2.8	3.1	1.2	1.3	3.5	2.0	2.2	1.0
OPT	1.4	4.2	0.2	-0.3	1.9	4.1	0.2	0.8
NCT								
VI	1.6	1.0	0.5	-0.2	1.7	1.0	1.3	0.1
RP	--	2.3	0.5	0.2	--	1.4	0.8	--
NT	1.1	0.2	0.5	0.5	0.9	1.6	1.0	-0.1

F = Form
Co = Color
R = Relational-Contextual
Ca = Categorical-Inferential

Table 4a

Percentage of Low Responders Using Grouping Responses for Each Style Category on the Pre- and Post- OCT and PCT Tests

(CT N = 25, NCT N = 25)

	Pre-OCT		Post-OCT		Pre-PCT		Post-PCT	
Style	CT	NCT	CT	NCT	CT	NCT	CT	NCT
Form	20	12	48	24	16	16	32	20
Color	36	28	80	48	32	24	72	40
Relational-Contextual	16	20	28	28	16	16	36	20
Categorical-Functional	8	16	20	36	4	8	20	8

Table 5

Means and Standard Deviations of the Scorable Responses
for Pretest, Posttest and Pre-Posttest Discrepancy
of the Low Responders in Each Experimental Condition

		Pretest		Posttest		Pre-Posttest Discrepancy	
Group	N	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
CT							
OT	8	14.8	10.0	23.1	1.6	8.9	9.7
PT	6	11.8	9.4	24.0	0	12.2	9.3
OPT	11	13.7	8.3	23.2	1.0	9.4	7.8
						$\bar{X}$ 9.9	
NCT							
VI	7	6.0	7.1	11.9	10.8	5.9	7.3
RP	7	9.0	7.3	11.9	7.9	2.8	6.2
NT	11	15.2	7.7	15.6	7.7	0.4	6.2
						$\bar{X}$ 2.6	

Analysis of Variance of Discrepancy in Number of Scorable Responses
from Pretest to Posttest

Source	df	MS	F	p
Groups	5	165.8	2.43	< .05
Errors	44	68.1		

Table 6

Changes in Discrepancy between Number of Scorable Responses Given on the OCT and PCT Tests from Pretest to Posttest for Low Responders in Each Experimental Condition

Group	Increase	Decrease	No Change
CT			
OT	37.5	50.0	12.5
PT	0	50.0	50.0
OPT	18.2	45.5	36.3
NCT			
VI	28.6	42.8	28.6
RP	42.9	14.2	42.9
NT	45.5	9.0	45.5

Table 7

Mean Number of Scorable Responses in Each Category Style
for the Pretest, Posttest and Pre-Post Discrepancy
for the OCT and PCT Tests for Low Responders
in Each Experimental Condition

Group		F	Co	R	Ca	F	Co	R	Ca
		Pretest OCT				Pretest PCT			
CT									
	OT	0.8	3.0	0.4	0.1	0.4	5.5	0.2	--
	PT	1.3	3.7	--	--	1.5	3.7	1.5	0.2
	OPT	1.0	2.2	2.8	0.4	0.4	2.0	2.4	0.3
NCT									
	VI	--	0.1	3.0	0.6	--	--	0.6	--
	RP	0.9	1.6	2.1	0.1	--	1.0	3.0	--
	NT	1.3	4.1	1.3	0.2	1.6	4.1	0.8	0.6
		Posttest OCT				Posttest PCT			
CT									
	OT	1.4	8.7	1.0	0.8	1.0	8.0	2.1	0.1
	PT	4.2	4.8	1.7	1.3	4.0	4.3	2.5	1.2
	OPT	2.6	6.0	1.9	0.7	2.4	5.6	2.6	1.3
NCT									
	VI	1.7	1.3	3.3	0.4	1.7	1.0	2.3	0.1
	RP	0.4	3.9	2.7	0.3	--	2.2	2.4	--
	NT	2.1	3.5	0.6	0.8	2.5	4.1	1.4	0.2
		Discrepancy OCT				Discrepancy PCT			
CT									
	OT	0.6	5.7	0.6	0.7	0.6	2.5	1.9	0.1
	PT	2.9	1.1	1.7	1.3	2.5	0.6	1.0	1.0
	OPT	1.6	3.8	-0.9	0.3	2.0	3.6	0.2	1.0
NCT									
	VI	1.7	1.2	0.3	-0.2	1.7	1.0	1.7	0.1
	RP	-0.5	2.3	0.6	0.2	--	1.2	-0.6	--
	NT	0.8	-0.6	-0.7	0.6	0.9	--	0.6	-0.4

Table 8

Percentage of Low Responders Using Each Style Category
on the Pre- and Post- OCT and PCT Tests

(CT N = 25, NCT N = 25)

Style	Pre-OCT		Post-OCT		Pre-PCT		Post-PCT	
	CT	NCT	CT	NCT	CT	NCT	CT	NCT
Form	24	12	52	28	24	16	40	20
Color	36	36	88	52	40	28	76	40
Relational-Contextual	36	40	40	36	28	40	44	40
Categorical-Inferential	12	20	36	36	12	8	32	12

Table 9

Means and Standard Deviations of Grouping and Scorable Responses for Both Tests in the Passive Condition for Low Responders of the CT and NCT Groups

		OCT		PCT	
Grouping	N	$\bar{X}$	SD	$\bar{X}$	SD
CT	25	6.8	2.6	6.1	2.0
NCT	25	2.4	2.5	2.7	2.1
Scorable					
CT	25	11.3	0.3	11.2	1.3
NCT	25	6.4	5.1	6.1	5.0

t Values of Differences between the CT and NCT groups for Each Criterion of Each Test

Criterion	Test	t	p
Grouping	OCT	6.03	< .001
	PCT	5.94	< .001
Scorable	OCT	4.62	< .001
	PCT	4.81	< .001

Table 10

Mean Number of Responses in Each Style Category for the OCT and PCT Tests in the Passive Condition in Each Experimental Condition

Group	F	Co	R	Ca	F	Co	R	Ca
	Grouping OCT				Scorable OCT			
CT								
OT	0.4	4.7	0.6	0.4	0.5	7.1	2.8	0.7
PT	2.5	4.0	0.8	0.7	4.8	4.8	1.2	0.7
OPT	0.9	4.2	0.6	1.2	1.2	5.3	3.3	1.5
NCT								
VI	0.8	0.7	0.8	--	1.6	1.0	2.7	0.7
RP	0.3	1.3	0.3	--	1.3	3.6	1.7	0.3
NT	0.4	1.8	0.4	0.1	0.7	3.4	1.6	0.2
	Grouping PCT				Scorable PCT			
CT								
OT	0.4	4.4	0.4	0.6	0.6	8.0	1.4	0.6
PT	1.5	2.8	1.0	0.5	4.3	4.3	2.2	0.7
OPT	0.9	2.7	1.1	1.7	1.2	4.1	3.6	2.5
NCT								
VI	0.6	0.7	0.7	0.3	1.6	1.1	2.7	0.6
RP	0.1	0.6	0.7	0.1	0.6	2.0	2.8	0.3
NT	0.4	1.5	0.1	0.3	1.3	3.9	0.4	0.4

Table 11

Percentage of Low Responders in the CT and NCT Groups Using Each Style Category in the Passive Condition
(N = 25)

Style	OCT-Passive		NCT-Passive	
	CT	NCT	CT	NCT
Form	48	28	42	24
Color	92	40	96	36
Relational-Contextual	68	48	76	44
Categorical-Inferential	48	24	68	20

Table 12

Mean Change Scores for Performance on the Haptic and Motor Encoding Tests

	Group	Haptic Test Mean Change	Sign Test
	CT		
	OT	0.8	NS
	PT	2.8	.02
	OPT	1.1	.02
	NCT		
	VI	0.9	NS
	RP	0.9	NS
	NT	3.8	.005
CT	p < .001		
NCT	p < .05		
Total Sample	p < .001		
		Motor Encoding Test	
	CT		
	OT	3.1	.04
	PT	1.2	NS
	OPT	3.9	.001
	NCT		
	VI	2.1	.01
	RP	3.0	.002
	NT	1.6	NS
CT	p < .001		
NCT	p < .001		
Total Sample	p < .001		